

**-SQA- SCOTTISH QUALIFICATIONS AUTHORITY**

**HIGHER NATIONAL UNIT SPECIFICATION**

**GENERAL INFORMATION**

<b>Unit Number</b>	<b>D3RD 04</b>
<b>Unit Title</b>	TRANSMISSION OF MEASUREMENT SIGNALS
<b>Superclass Category</b>	VE
<b>Date of Publication (month and year)</b>	
<b>Originating Centre for Unit</b>	Cleveland Open Learning Unit

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**DESCRIPTION**

**GENERAL COMPETENCE FOR UNIT:**

Analysing methods and techniques of transmitting measurement signals.

**OUTCOMES:**

1. analyse elements of pneumatic transmission systems;
2. analyse elements of instrument electrical transmission systems;
3. describe and analyse modulation system components;
4. analyse elements of digital transmission systems.

**CREDIT VALUE:** 1 HN Credit

**ACCESS STATEMENT:**

Access to this unit is at the discretion of the centre. It would, however, be beneficial if the student had competence in basic instrumentation systems and mathematics. Evidence of this competence could be possession of National Certificate modules in Instrumentation Systems and Mathematics or their equivalent.

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Additional copies of this unit can be obtained from: The Administrative Services Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ (Tel: 0141-242 2166).

At the time of publication, the cost is £2.50 (minimum order £5.00)

## HIGHER NATIONAL UNIT SPECIFICATION

### STATEMENT OF STANDARDS

#### Unit Number

#### Unit Title

TRANSMISSION OF MEASUREMENT  
SIGNALS

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the specification. All sections of the statement of the standards are mandatory and cannot be altered without reference to SQA.

#### OUTCOME

##### 1. ANALYSE ELEMENTS OF PNEUMATIC TRANSMISSION SYSTEMS

#### PERFORMANCE CRITERIA

- (a) Descriptions of the operation of pneumatic transmission system components are accurate.
- (b) Graphical representation of the capsule force/capsule differential pressure relationship is correct.
- (c) Calculations involving transmission system parameters are correct.

#### RANGE STATEMENT

System components: single beam d.p. transmitter; double beam d.p. transmitter; volume booster; direct-acting instrument relay; reverse acting instrument relay; non-bleed instrument relay; continuous bleed instrument relay; low pass instrument relay; high pass instrument relay; computing relay; flapper and nozzle; feedback bellows; input coil.

System parameters: bellows area; feedback pressure; differential pressure; input pressure; output pressure; range; capsule force; linkage constant; spring constant.

#### EVIDENCE REQUIREMENTS

- PC (a) Written and diagrammatic evidence to satisfy the performance criterion.
- PC (b) Graphical evidence to satisfy the performance criterion.
- PC (c) Calculations to satisfy the performance criterion and range.

#### OUTCOME

##### 2. ANALYSE ELEMENTS OF INSTRUMENT ELECTRICAL TRANSMISSION SYSTEMS

#### PERFORMANCE CRITERIA

- (a) The descriptions of the operation of instrument electrical transmission system components are accurate.
- (b) The description of hazardous area designations is correct.
- (c) Calculations involving instrument electrical transmission system parameters are correct.

**RANGE STATEMENT**

System components: variable capacitance sensing elements; electronic d.p. cells; P to I transducers; I to P transducers; Zener barriers; operational amplifiers; screened amplifiers.  
Hazardous Areas: Zone 0: Zone1: Zone 2.  
System Parameters: capacitance, effective CMR (common mode rejection ratio); true CMR; average CMR; source resistance; noise; earth difference voltage; circulating current; minimum ignition current; line to earth impedance; proportional constant; amplifier gain.

**EVIDENCE REQUIREMENTS**

PCs (a) & (b) Written evidence to satisfy the performance criteria.  
PC (c) Calculations to satisfy the performance criterion and range.

**OUTCOME**

**3. DESCRIBE AND ANALYSE MODULATION SYSTEM COMPONENTS**

**PERFORMANCE CRITERIA**

- (a) Standard symbols of filter circuits are drawn correctly.
- (b) Asymptotic gain/frequency responses of simple low and high pass filters are correctly plotted for given data.
- (c) The definitions and descriptions of the relative advantages of multiplexed transmission systems are correct.
- (d) Calculations involving instrument modulation system parameters are correct.

**RANGE STATEMENT**

Filter circuits: band stop; band pass; high pass; low pass.  
Multiplexed systems: time division multiplexing (TDM); frequency division multiplexing (FDM).  
Modulation system parameters: gain; modulation index; depth of modulation; impedance; resistance; reactance; modulation frequency; frequency deviation; bandwidth; periodic time; time constant; phase angle; voltage controlled oscillator (VCO) sensitivity.

**EVIDENCE REQUIREMENTS**

PC (a) Diagrammatic evidence to satisfy the performance criterion and range.  
PC (b) Diagrammatic evidence with supporting calculations to satisfy the performance criterion.  
PC (c) Written and diagrammatic evidence to satisfy the performance criterion.  
PC (d) Calculations to satisfy the performance criterion.

**OUTCOME**

**4. ANALYSE ELEMENTS OF DIGITAL TRANSMISSION SYSTEMS**

**PERFORMANCE CRITERIA**

- (a) Descriptions of features of digital transmission systems are correct.
- (b) The analysis of a ladder type digital-to-analogue converter is correct.
- (c) Descriptions of and calculations involving positional measurement transducers are correct.
- (d) Calculations involving code errors and code efficiency are correct.

**RANGE STATEMENT**

Features: aliasing; companding; quantisation; pulse code modulation; comparator type; analogue-to-digital converter.  
Positional measurement transducers: synchro-resolver; digital shaft encoder.  
Code errors: double parity error detection; chain code error detection.

**EVIDENCE REQUIREMENTS**

- PC (a) Written and diagrammatic evidence to satisfy the performance criterion.
- PC (b) Calculation to satisfy the performance criterion.
- PC (c) Written evidence and calculations to satisfy the performance criterion.
- PC (d) Calculations to satisfy the performance criterion and range.

**MERIT**

To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. In this unit this might be shown in one or more of the following ways:

- (a) transferring the competence gained in one situation to a related but unfamiliar situation.
- (b) demonstrating a critical awareness of the subject matter in relation to current transmission technology.
- (c) demonstrating an ability to use performance criteria in an integrative way to solve more complex problems than are necessary for the achievement of individual performance criteria.
- (d) applying the course knowledge gained to an actual situation.

**ASSESSMENT**

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes.)

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

**SPECIAL NEEDS**

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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## HIGHER NATIONAL UNIT SPECIFICATION

### SUPPORT NOTES

#### Unit Number

#### Unit Title

TRANSMISSION OF MEASUREMENT  
SIGNALS

#### SUPPORT NOTES:

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

#### NOTIONAL DESIGN LENGTH:

SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

**PURPOSE** The unit provides candidates with a background in and underpinning knowledge of the transmission of measurement signals.

#### ASSESSMENT PROCEDURES

Centres can use the instruments of assessment that they consider most appropriate.

#### REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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